

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Spectroscopic Planetary Detection

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OF POOR QUALITY

PERFORMING ORGANIZATION

Planetary Systems Branch, Code 693
Goddard Space Flight Center, Greenbelt MD 20771

INVESTIGATOR'S NAME

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DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

a. Strategy: One of the most promising methods for the detection of extra-solar planets is the spectroscopic method, where a small Doppler shift (~ 10 meters/sec) in the spectrum of the parent star reveals the presence of planetary companions. However, solar-type stars may show spurious Doppler shifts due to surface activity. If these effects are periodic, as is the solar activity cycle, then they may masquerade as planetary companions. The goal of this investigation is to determine whether the solar cycle affects the Doppler stability of integrated sunlight. Observations of integrated sunlight are made in the near infrared ($\sim 2 \mu\text{m}$), using the Kitt Peak McMath Fourier transform spectrometer, with an N_2O gas absorption cell for calibration. We currently achieve an accuracy of ~ 5 meters/sec. Solar rotation velocities vary by ± 2000 meters/sec across the solar disk, and imperfect optical integration of these velocities is our principal source of error.

b. Accomplishments: We have been monitoring the apparent velocity of integrated sunlight since 1983. We initially saw a decrease of ~ 30 meters/sec in the integrated light velocity from 1983 through 1985, but in 1987-88 the integrated light velocity returned to its 1983 level. It is too early to say whether these changes are solar-cycle related. Although the FTS, unlike a slit spectrograph, has a large field of view, we are always looking for ways to improve our optical integration of the solar disk. We recently made an improvement in the method used to optically collimate the FTS, and this has reduced our error level, eliminating some systematic effects seen earlier.

c. Anticipated accomplishments: We will continue to monitor the apparent velocity of integrated sunlight. When solar maximum has passed (>1991), we should know whether the changes seen earlier in integrated light velocity are periodic with the solar cycle, and thus to what degree solar-type stars can be expected to show spurious Doppler signals which might interfere with spectroscopic planetary detection.

d. Publications: "On the Apparent Velocity of Integrated Sunlight," D. Deming, F. Espenak, D. E. Jennings, J. W. Brault and J. Wagner 1987, Ap.J. 316, 771-787.